# List of Nomenclature

| Symbol | Description | Unit |
|--------|-------------|------|
| $\delta$ | Skin depth or penetration depth. | [mm] |
| $\mu$ | Magnetic permeability. | [H/m] |
| $\mu_r$ | Relative magnetic permeability. | [H/m] |
| $\mu_0$ | Permeability of free space. | [H/m] |
| $\rho$ | Electrical resistivity. | [$\Omega$.m] |
| $f$ | Applied frequency at the work-piece. | [Hz] |
| $J$ | Current density. | [A/m] |
| $\sigma$ | Electrical conductivity. | [S/m] |
| $\alpha$ | Temperature coefficient for the material. | [-] |
| $I_s$ | Surface current. | [A] |
| $c$ | Specific heat | [J/Kg.K] |
| $I_x$ | Current at distance $x$ | [A] |
| $T$ | Temperature | [$^\circ$c] |
| $T_{ph}$ | phase difference time | [s] |
| $T_{on}$ | Turn on time of PDM | [s] |
| $T_{off}$ | Turn off time of PDM | [s] |
| $f_{clk}$ | pulses with high frequency | [Hz] |
| $Q_{th}$ | Thermal energy | [kW/hr] |
| $M$ | Mass of the work piece | [Kg] |
| $\eta_{el}$ | Electrical efficiency | [-] |
| $\eta_{th}$ | Thermal efficiency | [-] |
| $A_g$ | The air gap cross section area | [m$^2$] |
| $A_w$ | The work-piece cross section area | [m$^2$] |
| $D_c$ | The diameter of the work piece | [m] |
| $l_c$ | The work-coil length | [m] |
| $Z$ | Load impedance | [$\Omega$] |
| $R_w$ | Work-piece resistance | [$\Omega$] |
| $R_c$ | Work-coil resistance | [$\Omega$] |

| | | |
|---|---|---|
| $X_w$ | Work-piece reactance | [Ω] |
| $X_c$ | Work-coil reactance | [Ω] |
| $X_g$ | Gap reactance. | [Ω] |
| $X_L$ | Load inductive reactance. | [Ω] |
| $X_c$ | Load capacitive reactance. | [Ω] |
| $R_p$ | Equivalent resistance for parallel resonance. | [Ω] |
| $X_P$ | Equivalent reactance for parallel resonance. | [Ω] |
| $R_L$ | Load equivalent resistance. | [Ω] |
| $\delta_c$ | Coil current penetration depth. | [mm] |
| $f_r$ | Resonant frequency. | [Hz] |
| $L_p$ | Load inductance | [H] |
| $C_t$ | Tank circuit capacitance | [F] |
| $Q_p$ | Parallel resonance quality factor. | [-] |
| $f_c$ | Critical frequency. | [Hz] |
| $v_{inv}$ | Inverter voltage | [V] |
| $i_{inv}$ | Inverter current | [A] |
| $M$ | Modulation index. | [-] |
| $D$ | Pulse density. | [-] |
| $\tau$ | Time constant. | [s] |
| $f_s$ | Switching frequency | [Hz] |
| $L_f$ | Filter inductance | [H] |
| $C_f$ | Filter capacitance | [F] |
| $L_c$ | Critical filter inductance | [H] |
| $f_i$ | input source frequency | [Hz] |
| $\Theta_{ref}$ | Reference phase angle | [Deg.] |
| $\Theta_{act}$ | Actual phase angle | [Deg.] |
| $P_{ref}$ | Reference (desired) system power | [kW] |
| $P_{act}$ | Actual system power | [kw] |
| $L_c$ | Series commutating inductor | [H] |
| $C_c$ | Series commutating capacitor | [F] |
| $C_s$ | Snubber capacitor | [F] |
| $R_s$ | Snubber resistance | [Ω] |

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# List of Abbreviations

| | |
|---|---|
| PDM | Pulse Density Modulation |
| PSC | Phase Shift Control |
| PWM | Pulse Width Modulation |
| AFC | Automatic Frequency Control |
| PFM | Pulse Frequency Modulation |
| DCC | Duty Cycle Control |
| PLL | Phase Locked Loop |
| DCM | Discontinuous Conduction Mode |
| AVC | Automatic Voltage Cancellation |
| FV | Frequency Variation |
| VCO | Voltage Controlled Oscillator |
| PFB | Power Feedback |
| PD | Phase Detector |
| CSI | Current Source Inverter |
| RMS | Root Mean Square |
| DC | Direct Current |
| AC | Alternating Current |
| GTO | Gate Turn Off Thyristor |
| PRC | Parallel Resonant Converter |
| SRC | Series Resonant Converter |
| ZVS | Zero Voltage Switching |
| ZCS | Zero Current Switching |
| IGBT | Insulated Gate Bipolar Transistor |
| SCR | Silicon Controlled Rectifier |
| BJT | Bipolar Junction Transistor |
| THD | Total Harmonic Distortion |
| EMF | Electromagnetic Force |
| EMI | Electro Magnetic Interference |
| ROM | Read Only Memory |
| PI | Proportional Integral |

# List of Illustrations

## I. Figures

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